King G

Vir

Executive Summary

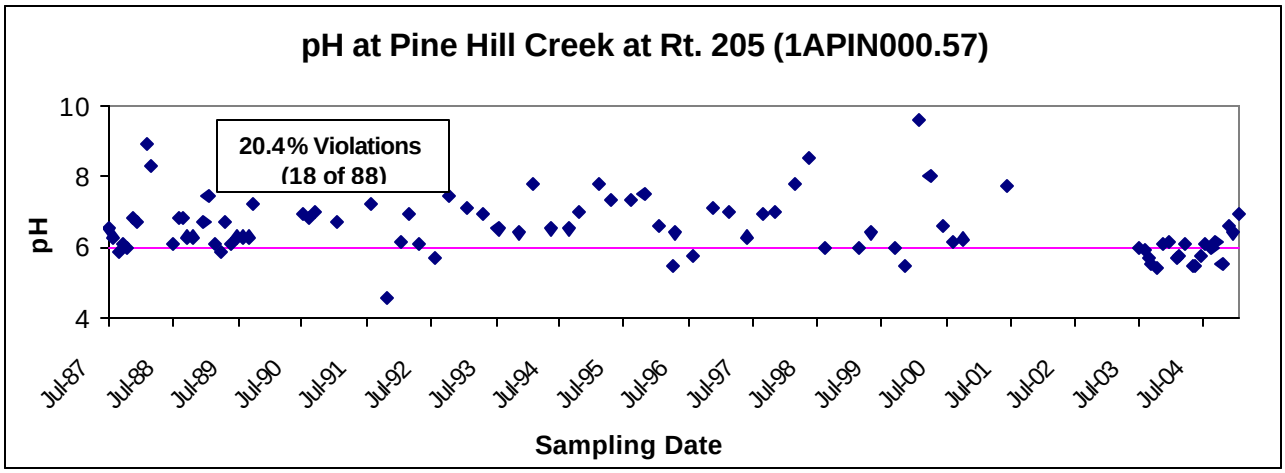
This report presents the assessment of whether low pH in the Pine Hill Creek watershed is due to natural conditions or wh
in the Potomac River and Shenandoah River Basins (USGS Hydrologic Unit Code 02070011). The waterbody impairment

There are 10.02 total stream miles in the Pine Hill watershed (National Hydrography Dataset (NHD). The original impaire

The drainage area of the Pine Hill Creek watershed is approximately 12.8 square miles. The average annual rainfall recor
watershed, with 11.9 percent cropland and 2.3 percent pasture/hayland. Residential and commercial areas compose app
water.

Pine Hill Creek was listed as impaired on Virginia's 2002 303(d) Report on Impaired Waters, and the 2004 305(b) / 303(d)
addressed in a separate assessment report. Out of 88 pH values collected between July 1987 and February 2005 at stat

Figure E1. pH at Pine Hill Creek at Rt. 205, 1APIN000.57 July 1987 through February 2005.



According to Virginia Water Quality Standards (9 VAC 25-260-10A), "all state waters are designated for the following use
expected to inhabit them; wildlife; and the production of edible and marketable natural resources (e.g., fish and shellfish).

As indicated above, Pine Hill Creek must support all designated uses by meeting all applicable criteria. Pine Hill Creek ha

In this document, VADEQ proposes a "Methodology for Determining if pH and DO Impairments in Streams are Due to Na
Pine Hill Creek can be re-classified as Class VII (Swamp Waters).

The level of acidity as registered by pH in a water body is determined by a balance between organic acids produced by de
where the decay of organic matter produces organic acids. These situations can be compounded by anthropogenic activi
conditions is to assess a series of water quality and hydrologic criteria to determine the likelihood of an anthropogenic so
natural condition is described below.

Step 1. Determine slope and appearance.
Step 2. Determine nutrient levels.
Step 3. Determine degree of seasonal fluctuation (for DO only).
Step 4. Determine anthropogenic impacts.

No low pH violations occurred below 7Q10 at listing station 1APIN000.57, therefore no pH violations were eliminated at th

Pine Hill Creek from rivermile 8.36 downstream to the confluence with Rosier Creek exhibits low slope and large areas of
the watershed produce weak organic acids and lower pH as they decay. These are not considered anthropogenic impacts

Pine Hill Creek exhibits low nutrient concentrations below national background levels in streams from undeveloped areas,

There are no permitted dischargers in the Pine Hill Creek watershed. Residential / Commercial land use (2.8 %) probably

There is not a close correlation between precipitation amounts and field pH at DEQ ambient water quality monitoring stati
correlation between the variables. However the extent to which stream pH is decreased by acid deposition cannot be cor

Based on the above information, a change in the water quality standards classification to Class VII Swampwater due to n
stream miles. If there is a 305(b)/303(d) assessment prior to the reclassification, this portion of Pine Hill Creek will be as

DEQ performed the assessment of the Pine Hill Creek low pH natural condition in lieu of a TMDL. Therefore neither a TM

1. Introduction

Pine Hill Creek was listed as impaired on Virginia's 2002 303(d) Report on Impaired Waters, and the 2004 305(b) / 303(d) conditions are the cause of the impairment, thus obviating the need for a TMDL. An assessment of low DO due to natural

A glossary of terms used throughout this report is presented as Appendix A.

2. Physical Setting

2.1. Listed Water Bodies

Pine Hill Creek is located in King George and Westmoreland Counties in the Potomac River and Shenandoah River Basir in the Pine Hill watershed (National Hydrography Dataset (NHD). The impaired segment is 8.50 miles in mainstem Pine H

Table 1. Impaired segment descriptions (Pine Hill Creek)

Segment (segm	Impairment (source of impairment)	Upstream Limit Des	Downstream Limit Des	Miles Affected
Pine Hill Creek VAP-A31R-01				

Figure 1. Map of the Pine Hill Creek study area.

2.2. Watershed

2.2.1. General Description

Pine Hill Creek, located within King George and Westmoreland Counties, Virginia, is a minor tributary to the Potomac Riv itself has an area of approximately 12.8 square miles. There is no continuous flow gaging station on Pine Hill Creek, howe

2.2.2. Geology, Climate, Land Use

Geology and Soils

Pine Hill Creek is in the Atlantic Coastal Plain physiographic region. The Atlantic Coastal Plain is the easternmost of Vir of rocky river rapids, the point at which east-flowing rivers cross from the hard, igneous and metamorphic rocks of the Pie eastward. These layers were deposited by rivers carrying sediment from the eroding Appalachian Mountains to the west. presently being deposited in our bays and along our beaches (http://www.geology.state.va.us/DOCS/Geol/coast.html).

Soils for the Pine Hill Creek watershed were documented utilizing the VA State Soil Geographic Database (STATSGO). Official Soil Series Description web site (http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi). Figure 2 shows the loca

The soils of the Emporia-Johnston-Kenansville-Remlik-Rumford-Slagle-Suffolk-Tomotley series (VA027) are very deep, poo sediments, and are typically fine to coarse loamy soils. Permeability of these soils ranges from slow to moderately rapid

The soils of the Craven-Mattaponi-Lenoir-Coxville Series (VA035) are very deep in which the drainage ranges from somew Physiographic Provinces of the Atlantic Coast, in which the parent materials consists of fluvial and marine sediments.

Soils of the Tetotum-Nansemond-State-Emporia-Dragston-Nimmo-Bladen Series (VA036) are very deep and range from v sediments on Coastal Plain uplands and stream terraces.

Figure 2. Soil Characteristics of the Pine Hill Creek Watershed.

Climate

The climate summary for Pine Hill Creek comes from a weather station located in Colonial Beach, VA, (441913) with a p
41.18 inches (Table 2) (Southeast Regional Climate Center, http://www.sercc.com/climateinfo/historical/historical_va.htm

Table 2. Climate summary for Colonial Beach, Virginia (441913)

													Annual

Land Use

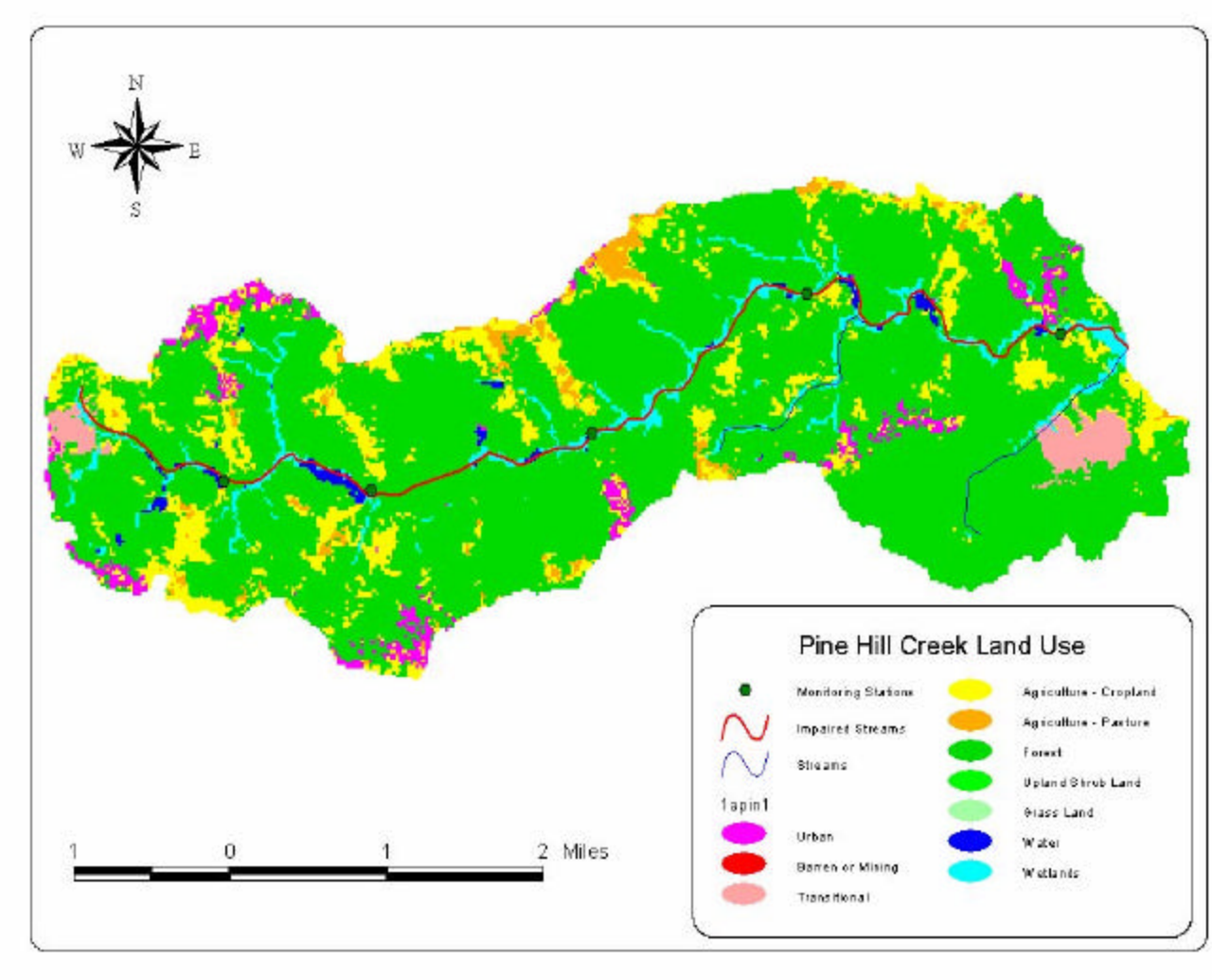
The Pine Hill Creek watershed extends approximately 9.5 miles from its headwaters near Edgehill, VA, to its confluence v percent of the watershed, with 11.9 percent cropland and 2.3 percent pasture/hayland. Residential and high use industria wetlands and open water. Land use is described in Table 3.

A map of the distribution of land use in the watershed (Figure 3) shows that agriculture and forest land cover the majority

Table 3. Land Use in the Pine Hill Creek Watershed

Landuse		Percent of Total
Open Water		
Low Intensity Residential		
High Intensity Residential		
High Intensity Commercial/Industrial/Transportation		
Bare Rock/Sand/Clay		
Quarries/Strip Mines/Gravel Pits		
Transitional		
Deciduous Forest		
Evergreen Forest		
Mixed Forest		
Pasture/Hay		
Row Crops		
Other Grasses (Urban/recreational; e.g. parks)		
Woody Wetlands		
Emergent Herbaceous Wetlands		
TOTAL:		

Figure 3. Land Use in the Pine Hill Creek Watershed.



3. Description of Water Quality Problem/Impairment

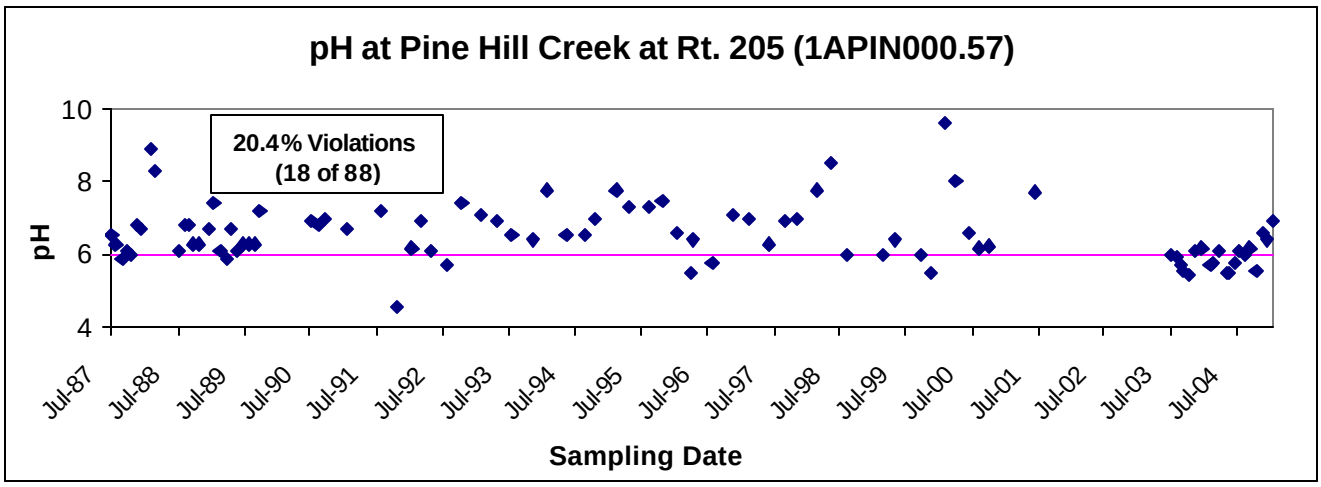
Pine Hill Creek was listed as impaired on Virginia's 2002 303(d) Report on Impaired Waters, and the 2004 305(b) / 303(d) conditions are the cause of the impairment, thus obviating the need for a TMDL. An assessment of low DO due to natural (Table 4), 18 were below the lower water quality standard for pH of pH 6 SU (Figure 4).

Table 4. pH data collected by DEQ on Pine Hill Creek

* Exceedances of the minimum pH water quality standard of pH 6.0 SU.

A time series graph of all data collected at station 1APIN000.57 shows the pH values ranging from 4.60 to 8.9 SU (Figure
standard.

Figure 4. Time series of pH concentrations (station 1APIN000.57).



3.1 Associated Mainstem and Tributary site pH

DEQ added four associated Pine Hill Creek watershed monitoring stations during data collection for the low pH assessme

Figure 5. pH at Pine Hill Creek at Rt. 620, 1APIN003.08.

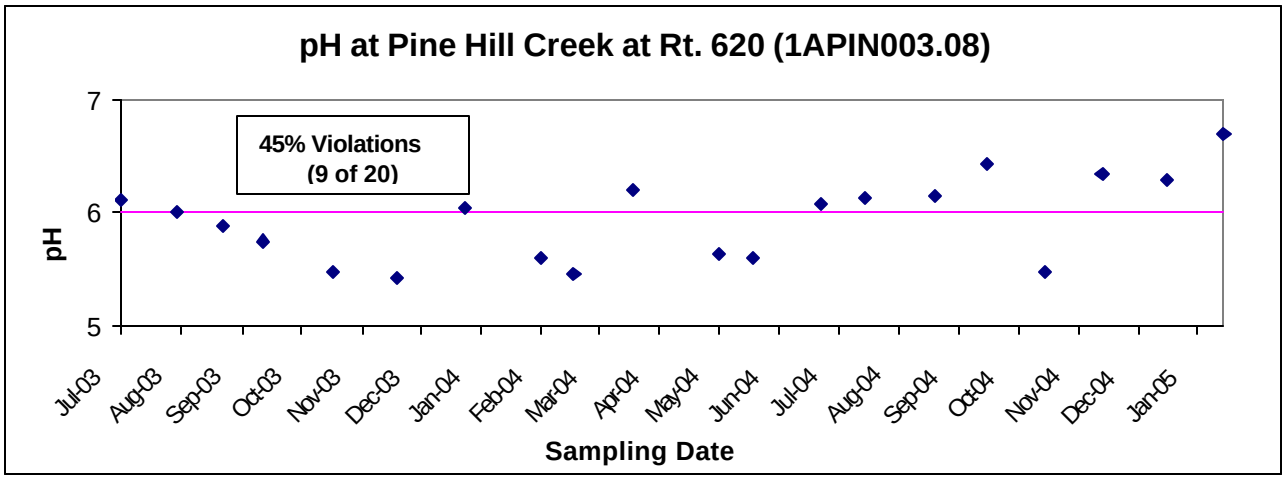


Figure 6. pH at Pine Hill Creek at Rt. 621, 1APIN004.94.

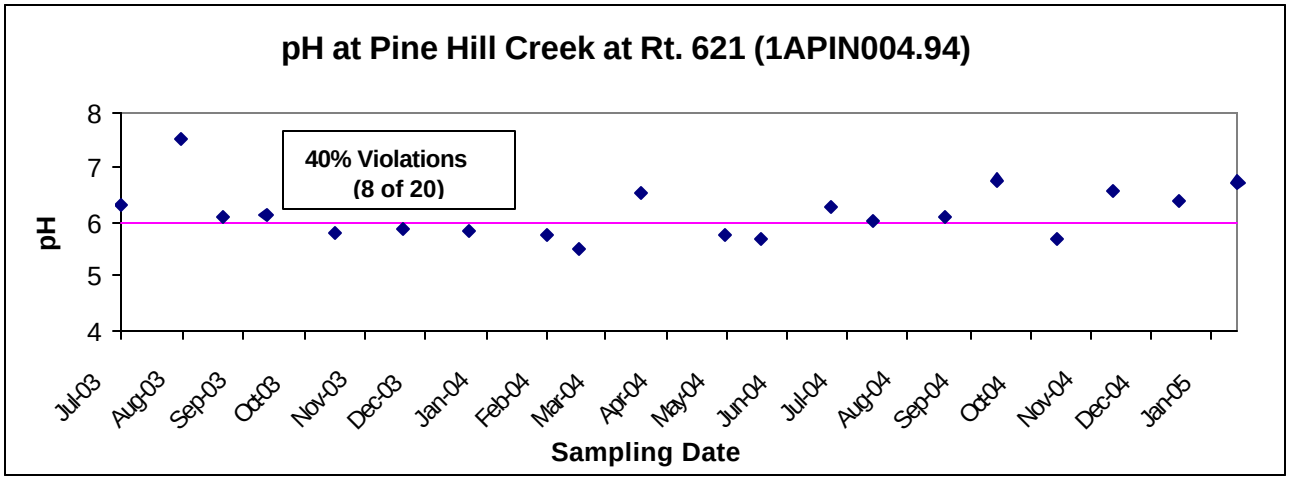


Figure 7. pH at Pine Hill Creek at Rt. 301, 1APIN007.24.

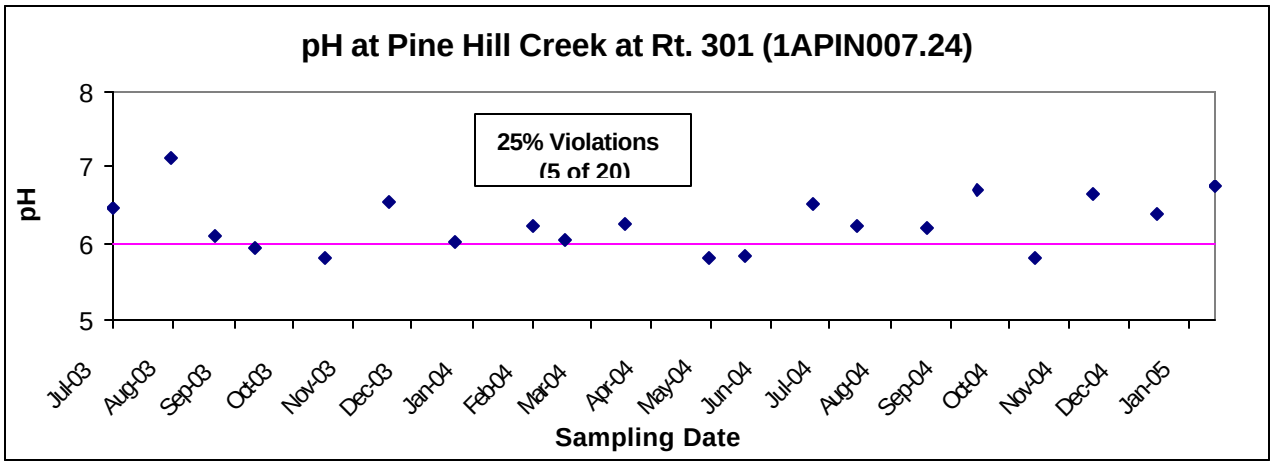
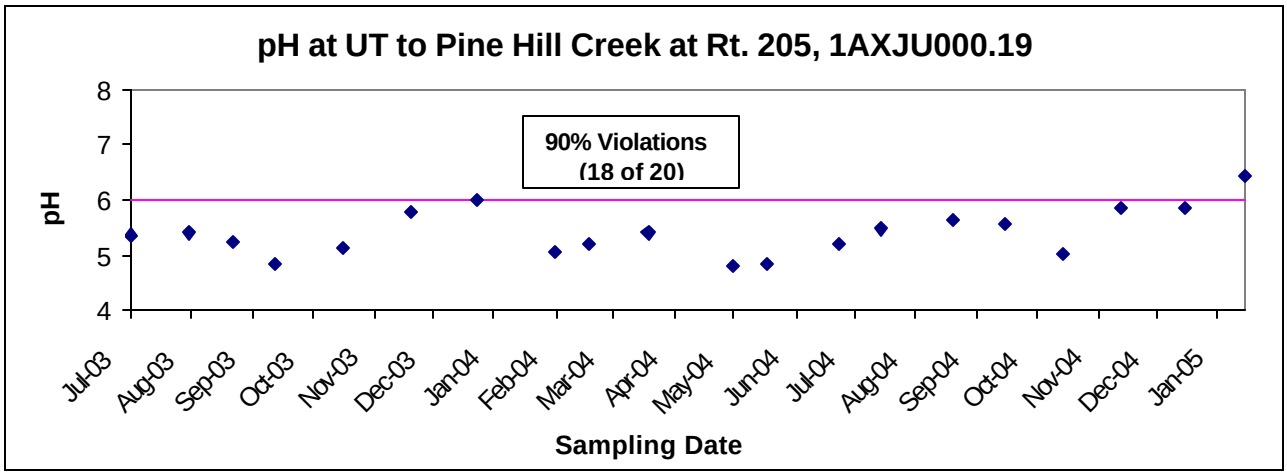


Figure 8. pH at UT to Pine Hill Creek at Rt. 205 (1AXJU000.19)



4. Water Quality Standard

According to Virginia Water Quality Standards (9 VAC 25-260-5), the term *"water quality standards means provisions of s*
standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the State Wa

As stated above, Virginia water quality standards consist of a designated use or uses and a water quality criteria. These

4.1. Designated Uses

According to Virginia Water Quality Standards (9 VAC 25-260-10A), *"all state waters are designated for the following use*
expected to inhabit them; wildlife; and the production of edible and marketable natural resources (e.g., fish and shellfish)

As stated above, Pine Hill Creek must support all designated uses by meeting all applicable criteria. Pine Hill Creek has

4.2. Applicable Water Quality Criteria

The Class III water quality criteria for pH in the Pine Hill Creek watershed is a minimum pH 6 SU and a maximum pH 9.0 S

Table 5. Applicable water quality standards

Parameter		
pH		

If the waterbody exceeds the criterion listed above in more than 10.5 percent of samples, the waterbody is classified as in
to believe that the waterbody has been mis-classified and that the apparent impairment is due to the swampy nature of th
is based on a study done by MapTech in the Appomattox River Basin (MapTech 2003) and will be used here to determine

5. Methodology for Natural Conditions Assessment

The level of acidity as registered by pH in a water body is determined by a balance between organic acids produced by de
where the decay of organic matter produces organic acids. These situations can be compounded by anthropogenic activit
conditions is to assess a series of water quality and hydrologic criteria to determine the likelihood of an anthropogenic so
natural condition is described below.

Step 1. Determine slope and appearance.

Step 2. Determine nutrient levels.
Step 3. Determine degree of seasonal fluctuation (for DO only).
Step 4. Determine anthropogenic impacts.

The results from this methodology (or process or approach) will be used to determine if the s

Assessme

Prepar

I. INTRODUCTION

Virginia's list of impaired waters currently shows many waters as not supporting the aquatic life use du
these streams or stream segments have been mis-classified and should more appropriately be classi
in a given stream or stream segment.

The level of dissolved oxygen (DO) in a water body is determined by a balance between oxygen-deple
promote a situation where oxygen-restoring processes are not sufficient to overcome the oxygen- dep
vegetative material, and buffering capacity.

Conditions in a stream that would typically be associated with naturally low DO and/or naturally low pH
organic acids (tannins, humic and fulvic substances). These situations can be compounded by anthro

The general approach to determine if DO and pH impairments in streams are due to natural condition identifying natural conditions that result in low DO and/or pH levels and for determining the likelihood o Water Control Law 9 VAC 25-260-55, Implementation Procedure for Dissolved Oxygen Criteria in Wa

Waters that are shown to have naturally low DO and pH levels will be re-classified as Class VII, Swam not needed for these waters. An assessment category of 4C will be assigned until the waterbody has

II. NATURAL CONDITION ASSESSMENT

Following a description of the watershed (including geology, soils, climate, and land use), a descriptio criteria that were the basis for the impairment determination, the available information should be evalu

Step 1. Determine appearance and flow/slope.

Streams or stream segments that have naturally low DO (< 4 mg/L) and low pH (< 6 SU) are character plant material that consumes oxygen as it decays. The decaying vegetation in a swamp water also pr the form of tannic acids, humic acids, and fulvic acids that are highly colored. The trees of swamps hav acidic than marsh streams.

Appearance and flow velocity (or slope if flow velocity is not available) must be identified for each stre photos, field measurements or other appropriate means.

Step 2. Determine nutrient levels.

Excessive nutrients can cause a decrease in DO in relatively slow moving systems, where aeration is growth, and the resulting die-off and decay of excessive plankton or macrophytes can decrease DO le

USGS (1999) estimated national background nutrient concentrations in streams and groundwater from concentrations are less than 1.0 mg/L, and average background concentrations of total phosphorus (T

Nutrient levels must be documented for each stream or stream segment to be assessed for natural co concentrations should be further evaluated for potential impacts from anthropogenic sources.

Step 3. Determine degree of seasonal fluctuation (for DO only).

Anthropogenic impacts on DO will likely disrupt the typical seasonal fluctuation seen in the DO concen in the summer months and recovers during the winter, as would be expected in natural systems. A wea

Step 4. Determine anthropogenic impacts.

Every effort should be made to identify human impacts that could exacerbate the naturally low DO and Land use analysis can also be a valuable tool for identifying potential human impacts.

Lastly, a discussion of acid rain impacts should be included for low pH waters. The format of this discu (letter from DEQ to EPA, 14 October 2003). An alternative is a prototype regional stream comparisor this document, or the example report prepared for Pine Hill Creek , illustrate this approach. For strear

7Q10 Data Screen

If the data warrant it, a data screen should be performed to ensure that the impairment was identified b flow was < 7Q10 should be eliminated from the data set and the violation rate recalculated accordingly

In some cases, data were collected when flow was 0 cfs. If the 7Q10 is identified as 0 cfs as well, all d
Impaired due to natural conditions, no TMDL needed. However, a reclassification to Class VII may no

III. NATURAL CONDITION CONCLUSION MATRIX

The following decision process should be applied for determining whether low pH and/or low DO value

If velocity is low or if slope is low (<0.50%) AND
If wetlands are present along stream reach AND
If no point sources or only point sources with minimal impact on DO and pH AND
If nutrients are < typical background

- ❖ average (= assessment period mean) nitrate less than 0.6 mg/L
- ❖ average total nitrogen (TN) less than 1.0 mg/L, and
- ❖ average total phosphorus (TP) are less than 0.1 mg/L AND

For DO: If seasonal fluctuation is normal AND
For pH: If nearby streams without wetlands meet pH criteria OR if no correlation between in-stre

THEN determine as impaired due to natural condition
→ assess as category 4C in next assessment
→ initiate WQS reclassification to Class VII Swamp Water
→ get credit under consent decree

The analysis must state the extent of the natural condition based on the criteria outlined above. A map

In cases where not all of these criteria apply, a case by case argument must be made based on the sp

6. Natural Conditions Assessment for Pine Hill Creek

6.1 7Q10 Low Flow Screening

The 7Q10 flow of a stream is the lowest streamflow for seven consecutive days that occurs on average once every ten ye

The 7Q10 flows for the Pine Hill Creek pH station may be estimated by a drainage area comparison at 1APIN000.57 with
near Garrisonville was used with a drainage area ratio with the pH site, yielding 7Q10 flows of 0.01 cfs at 1APIN000.57.

The pH Instantaneous Water Quality Standard applies **AT** 7Q10 flow, but **NOT** below 7Q10 flow (9 VAC 25-260-50 ***). T
pH data < pH 6.0 mg/l are standard violations, even if the flow = 0 cfs when the pH was taken.

At station 1APIN000.57 on Pine Hill Creek, flow was less than the 7Q10 of 0.01 cfs for 11 days in August, September an
violations to eliminate.

6.1 Slope and Appearance

There were no discharge measurements made at the Rt. 205 bridge, the original 303(d) listing station. The hydrologic slop
estimated at 0.29%, which is considered low slope. The upstream location comprises the approximate upstream bounda
segment. The low slope in this 8.36 mile segment contributes no human impact. This low slope segment compasses al

Pine Hill Creek from rivermile 8.36 downstream to the confluence with the Rosier Creek exhibits low slope (0.29%) and la
canopy throughout the watershed produce weak organic acids and lower pH as they decay. These are not considered an

Visual inspections from bridges at Rts. 205, 620 and 301 revealed large swamp areas with heavy tree canopy. There are l

Figure 9. Pine Hill Creek at Rt. 205.

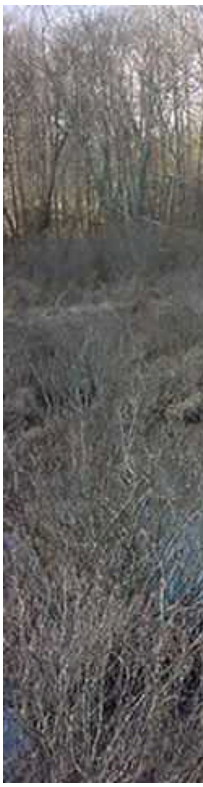


Figure 10. Pine Hill Creek at Rt. 301.

Figure 11. Pine Hill Creek at Rt. 620.

Figure 12. UT to Pine Hill Creek at Rt. 205.

6.2 Instream Nutrients

The VADEQ collected nutrient data from station 1APIN000.57 from February 1990 to February 2005. The average nutrient
mg/l; and TP $\leq$ 0.1 mg/l. While average TP is right at the USGS background level, the watershed is predominately forest

Parameter	Average Conc.	Number
Total Phosphorus	**0.100 mg/l**	(n=65)
Orthophosphorus	0.065 mg/l	(n=65)
Total Kjeldahl Nitrogen	0.435 mg/l	(n=65)
Ammonia as N	0.028 mg/l	(n=66)
Nitrate as N	**0.141 mg/l**	(n=57)
Nitrite as N	0.007 mg/l	(n=57)
TN (TKN + NO_3 + NO_2)	**0.565 mg/l**	(n=66)

6.3 Impact from Point Source Dischargers and Land Use

There are no permitted dischargers in the Pine Hill Creek watershed. Residential / Commercial land use (2.8%) probably low 14.2 percent, which is mostly row crops.

6.4 Human Impact from Acid Deposition

Acid deposition is expected to occur in the Pine Hill Creek watershed, however rainfall pH data are difficult to collect and occurred in the Charlottesville dataset, with weekly rainfall pH during the period from 1990 to 2003 averaging 4.35 SU (SD about 5.5.

One method to assess whether acid deposition adversely impacts low pH in a waterbody is to compare daily precipitation filtered daily rainfall data for 1996 - 2003 according to water sample collection dates at DEQ ambient water quality monito calculated. The only discernable pattern was a general negative correlation of precipitation to pH and the majority of r-valu 2003 in Appendix B.

However the extent to which stream pH is decreased by acid deposition in Virginia cannot be decisively established. Sig

7.0 CONCLUSION

The following decision process is proposed for determining whether low pH values are due to natural conditions:

If slope is low (<0.50) AND
If wetlands are present along stream reach AND
If no point sources or point sources with minimal impact on pH AND
If nutrients are < typical background

- ❖ average (= assessment period mean) nitrate less than 0.6 mg/L
- ❖ average total nitrogen (TN) less than 1.0 mg/L, and
- ❖ average total phosphorus (TP) are less than 0.1 mg/L AND

If nearby streams without wetlands meet pH criteria,

THEN determine as impaired due to natural condition
→ assess as category 4C in next assessment
→ initiate WQS reclassification to Class VII Swamp Water
→ get credit under consent decree

Pine Hill Creek from rivermile 8.36 downstream to the confluence with Rosier Creek exhibits low slope (0.29%) and large
throughout the watershed produce weak organic acids and lower pH as they decay. These are not considered anthropoge

Pine Hill Creek exhibits low nutrient concentrations below national background levels in streams from undeveloped areas,

There are no permitted dischargers in the Pine Hill Creek watershed. Residential / Commercial land use (2.8%) probably

There is not a close correlation between precipitation amounts and field pH at DEQ ambient water quality monitoring stati
correlation between the variables. However the extent to which stream pH is decreased by acid deposition cannot be cor

Based on the above information, a change in the water quality standards classification to Class VII Swampwater due to n
9.90 stream miles.

8.0. Public Participation

DEQ performed the assessment of the Pine Hill Creek low pH natural condition in lieu of a TMDL. Therefore neither a TM

9.0 References

Maptech, Methodology for Assessing Natural Dissolved Oxygen and pH Impairments: Application to the Appomattox Ri

SRCC (Southeast Regional Climate Center) http://www.dnr.state.sc.us/climate/sercc/products/historical/historical_va.htm

USGS (United States Geological Survey), National Background Nutrient Concentrations in Streams from Undeveloped Are

VADEQ (Virginia Department of Environmental Quality), Virginia Water Quality Assessment 1998. Virginia. 1998.

VADEQ (Virginia Department of Environmental Quality), Virginia Water Quality Assessment 2002. Virginia. 200

GLOSSARY

Note: All entries in italics are taken from USEPA (1998). All non-italicized entries are taken fr

303(d). A section of the Clean Water Act of 1972 requiring states to identify and list water bodies that do not meet the states' water quality standards.

Ambient water quality. *Natural concentration of water quality constituents prior to mixing of either point or nonpoint source load of contaminants. Reference ambient concentration is used to indicate the concentration of a chemical that will not cause adverse impact on human health.*

Anthropogenic. *Pertains to the [environmental] influence of human activities.*

Background levels. *Levels representing the chemical, physical, and Bacterial conditions*

that would result from natural geomorphological processes such as weathering or dissolution.

Best management practices (BMPs). *Methods, measures, or practices determined to be*

reasonable and cost-effective means for a landowner to meet certain, generally nonpoint source, pollution control needs. BMPs include structural and nonstructural controls and operation and maintenance procedures.

Clean Water Act (CWA). *The Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972), Public Law 92-500, as amended by Public Law 96-483 and Public Law 97-117, 33 U.S.C. 1251 et seq. The Clean Water Act (CWA) contains a number of provisions to restore and maintain the quality of the nation's water resources. One of these provisions is section 303(d), which establishes the TMDL program.*

Concentration. *Amount of a substance or material in a given unit volume of solution; usually measured in milligrams per liter (mg/L) or parts per million (ppm).*

Confluence. The point at which a river and its tributary flow together.

Contamination. *The act of polluting or making impure; any indication of chemical, sediment, or Bacterial impurities.*

Designated uses. *Those uses specified in water quality standards for each waterbody or segment whether or not they are being attained.*

Dilution. *The addition of some quantity of less-concentrated liquid (water) that results in a decrease in the original concentration.*

Direct runoff. *Water that flows over the ground surface or through the ground directly into streams, rivers, and lakes.*

Discharge. *Flow of surface water in a stream or canal, or the outflow of groundwater from a flowing artesian well, ditch, or spring. Can also apply to discharge of liquid effluent from a facility or to chemical emissions into the air through designated venting mechanisms.*

Discharge permits (under VPDES). *A permit issued by the U.S. EPA or a state regulatory agency that sets specific limits on the type and amount of pollutants that a municipality or industry can discharge to a receiving water; it also includes a compliance schedule for achieving those limits. The permit process was established under the National Pollutant Discharge Elimination System, under provisions of the Federal Clean Water Act.*

Domestic wastewater. *Also called sanitary wastewater, consists of wastewater discharged from residences and from commercial, institutional, and similar facilities.*

Drainage basin. *A part of a land area enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into a receiving water. Also referred to as a watershed, river basin, or hydrologic unit.*

Effluent. *Municipal sewage or industrial liquid waste (untreated, partially treated, or completely treated) that flows out of a treatment plant, septic system, pipe, etc.*

Effluent limitation. *Restrictions established by a state or EPA on quantities, rates, and concentrations in pollutant discharges.*

Existing use. *Use actually attained in the waterbody on or after November 28, 1975, whether or not it is included in the water quality standards (40 CFR 131.3).*

GIS. Geographic Information System. A system of hardware, software, data, people, organizations and institutional arrangements for collecting, storing, analyzing and disseminating information about areas of the earth. (Dueker and Kjerne, 1989)

Hydrologic cycle. *The circuit of water movement from the atmosphere to the earth and its*

return to the atmosphere through various stages or processes, such as precipitation, interception, runoff, infiltration, storage, evaporation, and transpiration.

Hydrology. *The study of the distribution, properties, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.*

In situ. *In place; in situ measurements consist of measurements of components or processes in a full-scale system or a field, rather than in a laboratory.*

Margin of safety (MOS). *A required component of the TMDL that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving waterbody (CWA section 303(d)(1)(C)). The MOS is normally incorporated into the conservative assumptions used to develop TMDLs (generally within the calculations or models) and approved by EPA either individually or in state/EPA agreements. If the MOS needs to be larger than that which is allowed through the conservative assumptions, additional MOS can be added as a separate component of the*

TMDL (in this case, quantitatively, a TMDL = LC = WLA + LA + MOS).

Mean. The sum of the values in a data set divided by the number of values in the data set.

MGD. Million gallons per day. A unit of water flow, whether discharge or withdraw.

Monitoring. *Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.*

Narrative criteria. *Nonquantitative guidelines that describe the desired water quality goals.*

National Pollutant Discharge Elimination System (NPDES). *The national program for issuing, modifying, revoking and re-issuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Clean Water Act.*

Natural waters. *Flowing water within a physical system that has developed without human intervention, in which natural processes continue to take place.*

Non-point source. *Pollution that originates from multiple sources over a relatively large area. Nonpoint sources can be divided into source activities related to either land or water use including failing septic tanks, improper animal-keeping practices, forest practices, and urban and rural runoff.*

Numeric targets. *A measurable value determined for the pollutant of concern, which, if achieved, is expected to result in the attainment of water quality standards in the listed waterbody.*

Organic matter. *The organic fraction that includes plant and animal residue at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized*

by the soil population. Commonly determined as the amount of organic material contained in a soil or water sample.

Peak runoff. *The highest value of the stage or discharge attained by a flood or storm event; also referred to as flood peak or peak discharge.*

Permit. *An authorization, license, or equivalent control document issued by EPA or an approved federal, state, or local agency to implement the requirements of an environmental regulation; e.g., a permit to operate a wastewater treatment plant or to operate a facility that may generate harmful emissions.*

Point source. *Pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from either municipal wastewater treatment plants or industrial waste treatment facilities. Point sources can also include pollutant loads contributed by tributaries to the main receiving water stream or river.*

Pollutant. *Dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, Bacterial materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water. (CWA section 502(6)).*

Pollution. *Generally, the presence of matter or energy whose nature, location, or quantity produces undesired environmental effects. Under the Clean Water Act, for example, the term is defined as the man-made or man-induced alteration of the physical,*

Bacterial, chemical, and radiological integrity of water.

Public comment period. *The time allowed for the public to express its views and concerns regarding action by EPA or states (e.g., a Federal Register notice of a proposed rule-making, a public notice of a draft permit, or a Notice of Intent to Deny).*

Raw sewage. *Untreated municipal sewage.*

Receiving waters. *Creeks, streams, rivers, lakes, estuaries, ground-water formations, or other bodies of water into which surface water and/or treated or untreated waste are discharged, either naturally or in man-made systems.*

Restoration. *Return of an ecosystem to a close approximation of its presumed condition*

prior to disturbance.

Riparian areas. *Areas bordering streams, lakes, rivers, and other watercourses. These areas have high water tables and support plants that require saturated soils during all or part of the year. Riparian areas include both wetland and upland zones.*

Riparian zone. *The border or banks of a stream. Although this term is sometimes used interchangeably with floodplain, the riparian zone is generally regarded as relatively narrow compared to a floodplain. The duration of flooding is generally much shorter, and the timing less predictable, in a riparian zone than in a river floodplain.*

Runoff. *That part of precipitation, snowmelt, or irrigation water that runs off the land into streams or other surface water. It can carry pollutants from the air and land into receiving waters.*

Slope. *The degree of inclination to the horizontal. Usually expressed as a ratio, such as 1:25 or 1 on 25, indicating one unit vertical rise in 25 units of horizontal distance, or in a decimal fraction (0.04), degrees (2 degrees 18 minutes), or percent (4 percent).*

Stakeholder. Any person with a vested interest in assessment of natural condition or TMDL developn

Standard. In reference to water quality (e.g. pH 6 – 9 SU limit).

Storm runoff. *Storm water runoff, snowmelt runoff, and surface runoff and drainage; rainfall that does not evaporate or infiltrate the ground because of impervious land surfaces or a soil infiltration rate lower than rainfall intensity, but instead flows onto adjacent land or into waterbodies or is routed into a drain or sewer system.*

Streamflow. *Discharge that occurs in a natural channel. Although the term "discharge" can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than "runoff" since streamflow may be applied to discharge whether or not it is affected by diversion or regulation.*

Stream restoration. *Various techniques used to replicate the hydrological, morphological, and ecological features that have been lost in a stream because of urbanization, farming, or other disturbance.*

Surface area. *The area of the surface of a waterbody; best measured by planimetry or the use of a geographic information system.*

Surface runoff. *Precipitation, snowmelt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions; a major transporter of nonpoint source pollutants.*

Surface water. *All water naturally open to the atmosphere (rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors directly influenced by surface water.*

Topography. *The physical features of a geographic surface area including relative elevations and the positions of natural and man-made features.*

Total Maximum Daily Load (TMDL). *The sum of the individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources and natural background, plus a margin of safety (MOS). TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measures that relate to a state's water quality standard.*

Tributary. *A lower order-stream compared to a receiving waterbody. "Tributary to" indicates the largest stream into which the reported stream or tributary flows.*

Variance. A measure of the variability of a data set. The sum of the squared deviations (observation – mean) divided by (number of observations) – 1.

DCR. Department of Conservation and Recreation.

DEQ. Virginia Department of Environmental Quality.

VDH. Virginia Department of Health.

Wastewater. *Usually refers to effluent from a sewage treatment plant. See also* ***Domestic wastewater****.*

Wastewater treatment. *Chemical, Bacterial, and mechanical procedures applied to an industrial or municipal discharge or to any other sources of contaminated water to remove, reduce, or neutralize contaminants.*

Water quality. *The Bacterial, chemical, and physical conditions of a waterbody. It is a measure of a waterbody's ability to support beneficial uses.*

Water quality criteria. *Elements of the board's water quality standards, expressed as constituent generally protect the designated use.*

Water quality standard. *Provisions of state or federal law which consist of a designated use or uses health or welfare, enhance the quality of water and serve the purposes of the State Water Control La*

Watershed. *A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.*

CLASS VII RE-

ATTACHMENT III – CLASS VII RE-CLASSIFICATION LETTER USED IN LAST TRIENNIAL REVIEW

October 14, 2003

MEMORANDUM

TO: EPA Region 3
FROM: David C. Whitehurst
SUBJECT: Supporting Data for Proposed Class VII (Swamp Waters) pH Criteria

As required by 40 CFR ?131.20, the purpose of this memo is to provide supporting data and information for Virginia's prop
southeastern portion of the state as an effort to reflect the natural conditions of those waters and as an aid for the appropriate asse

These waters were classified by the Virginia Water Quality Standards as Class III Coastal and Piedmont Nontidal Waters (9
and low dissolved oxygen caused by:

(1) low flow velocity that prevents mixing and re-aeration of stagnant, shallow waters and (2)
decomposition of vegetation that lowers dissolved oxygen concentrations and causes tannic acids to color the water and lower the p
designated uses. Aquatic life uses shall be maintained and required effluent pH limits of 6.0 - 9.0 shall be maintained for all discharg

The water bodies that are proposed for Class VII designation are frequently referred to as blackwater streams/rivers due to
blackwater systems can range from 3.5 - 6 and in mineral soil draining systems from 4 - 7. The naturally occurring acidic conditions c
and laboratory methods for macroinvertebrate and habitat assessment of low gradient nontidal streams" states that "Coastal plain s

soils. The pH of these streams most often ranges from 3.5 to 7.5." (Appendix B)

Ambient water quality monitoring field pH data for stations within waters that are proposed as Class VII is presented in Ap for each monitoring station were also graphed. The majority (> 50%) of individual pH values were below 7.

In an effort to confirm that point source discharges were not contributing to the low pH values, the DEQ permitting databa three violations for discharge over the upper limit for pH (pH> 9), and one facility for effluent discharge less than the lower require

At the request of EPA Region 3 for DEQ to demonstrate that proposed Class VII waters are not impacted by acid rain that w 1996 - 2003 was filtered according to water sample collection dates at DEQ ambient water quality monitoring stations that are within a general negative correlation of precipitation to pH and the majority of r-values were well below 0.5, which does not indicate a clos

According to an EPA web site (http://www.epa.gov/airmarkets/acidrain/index.html) the natural pH of rain is about 5.5 and neutralizing capacity of the Virginia Coastal Plains watersheds, they are considered to be sensitive to atmospheric acid deposition (Virginia conducted by Virginia Commonwealth University and DEQ found significant differences between pH depression duration depressions (Appendix G).

Other states such as North Carolina have narrative and numerical criteria in their water quality standards that recognize so Virginia alter its numerical criterion for pH to reflect the naturally occurring conditions within certain water bodies in the state.

Attachments